

Lab #16: Geology 4 (Chapter 10)

Petrology

INTRODUCTION:

The objective of this lab is to learn how to identify basic rock types, like those found in the Grand Canyon.

MATERIALS

- Rock kit (e.g., www.cornerstone-edsupply.com) that includes rock testing equipment

METHODS

1. Preparation: The teacher should remove all of the rocks from the box and mix them.
2. Preparation: The teacher should make black and white copies of the rock placement sheet from the rock kit (with names only—no pictures) and place one beside each empty rock kit box.
3. Students: Read the general information below (and in the provided chart), review how the three types of rocks (sedimentary, igneous, and metamorphic) form, and study the rock identification charts.
4. Identify the more distinctive rocks first (e.g., coal, obsidian, coquina, limestone, and pumice). Place the identified rock in the correct spot in the rock kit box, corresponding to the name chart beside the box.
5. Attempt to identify the soft metamorphic rocks (soapstone, slate, and marble) using the chart and hardness scale.
6. Attempt to identify the remaining metamorphic rocks using the following process:

Is it metamorphic?

- Does it shine/shimmer in light? (non-foliated often won't, but foliated often will)
 - Stripes/banding/ribbons? (not "stacked" like sedimentary rock)
 - Lots of reflective flecks? (use magnifier if necessary)
 - Organized patterns in the grains, flowing in the same direction?
 - Foliated (stripes/bands)? (some metamorphic won't)
 - Overall gray, but very distinct black and white bands/foliations cutting through it? (gneiss)
 - Can it scratch glass? (slate, marble cannot)
 - If it can't scratch glass and its grains seem to have no clear orientation/pattern, large crystals with random distribution, non-foliated, typically white or gray, it may be marble. (test it with the acid test)
 - Flat sheet layers and can't cut glass? (slate)
7. Attempt to identify siltstone and sandstone using the chart.
 8. Use the chart to identify the remaining igneous rocks.
 9. Label on the rock placement sheet with "S," "M," and "I" which rocks are sedimentary, metamorphic, or igneous.



RESULTS/DISCUSSION

1. Given the way in which sedimentary, igneous, and metamorphic rocks form, discuss whether (and why) we would expect to find all three types in the Grand Canyon. _____

2. What would we expect to be the most predominate form of rock(s) in the Grand Canyon above the “Great Unconformity”? Why? _____

3. What might we expect to be the **predominate** form of rock in the Grand Canyon below the Great Unconformity? Why? What other type of rock would likely be found in abundance and why? Why would the third type of rock be rare? _____

4. The rocks below the Great Unconformity in the Grand Canyon are granite, schist, and gneiss. Identify which of the three types of rocks each of these are. _____

5. Why might metamorphic rock be found below the Great Unconformity? _____

6. The rocks above the Great Unconformity are sandstone, shale, and limestone. Identify which of the three types of rocks each of these are. _____

GENERAL INFORMATION

- Igneous rocks (e.g., granite, basalt, obsidian, etc.) form when magma (melted rock) from within the Earth cools and hardens. Igneous rocks have little texture or layering. Rocks like these contain mostly black, white and/or gray minerals; large crystals.
- Sedimentary rocks (e.g., limestone, sandstone, shale, gypsum, etc.) form when sediments (e.g., sand or mud) or organic materials (e.g., shells, plants, bones, etc.) accumulate and get buried and compacted. Once they are dense enough, they become a rock. So, sedimentary rocks are hardened sediment with sandy or clay-like layers (strata). They are usually brown to gray in color and may have fossils and water or wind marks.
- Metamorphic rocks (e.g., marble, slate, schist, gneiss, etc.) form when sedimentary, igneous, or even other metamorphic rocks are subjected to major pressure or heat that changes their composition. Metamorphic rocks, such as marble, are tough, with straight or curved layers (foliation) of light and dark minerals. They come in various colors and often contain glittery mica. Often look crystalline and with a “squashed” texture.



- The hardness of a rock is measured using the Mohrs scale and is based on the minerals that comprise a rock. If a rock can scratch another object, it is harder than the object, and vice versa. The hardness of the following items is used to determine the hardness of rocks/minerals:

Fingernail: 2.5; Penny: 3.0; Nail: 4-5; Glass plate: 5.5; Streak plates: 6.5

[Rock information gathered primarily from "Everything You Need to Identify Rocks (thoughtco.com) and "How to Identify Metamorphic Rocks: 12 Steps (with Pictures)" (wikihow.com)]

Metamorphic Rock Identification

Foliation	Grain Size	Usual Color	Other	Rock Type	Hardness
foliated	fine	light	very soft; greasy feel	Soapstone	2.5-3.5
foliated	fine	dark	soft; strong cleavage	Slate	2.5-4
foliated	coarse	mixed dark and light	wrinkled foliation; often has large crystals (sparkling)	Schist	5-6.5
foliated	coarse	mixed	Parallel mineral bands	Gneiss	6-7
nonfoliated	coarse	light	soft; calcite or dolomite by the acid test; architecture	Marble	3
Nonfoliated/or weak foliated	fine	green	Tough, dark	Greenstone	4-5

Sedimentary Rock Identification

Grain Size	Composition	Other	Rock Type	Hardness
coarse	clean quartz	White, gray, to brown; compressed sand	Sandstone	Hard, 6-7
fine	very fine sand; no clay	feels gritty on teeth; red/gray	Siltstone	Hard, 4.5-5.5
fine	carbon	black; burns with tarry smoke	Coal (bituminous)	Soft, 2
fine	calcite	Dense; fizzes with acid; formed from shells, coral, etc.	Limestone	Soft, 3-4
coarse	fossil shells	mostly pieces	Coquina	Soft, 2-3

Igneous Rock Identification

Grain Size	Usual Color	Other	Composition	Rock Type	Hardness
fine	dark	glassy appearance	lava glass	Obsidian	6-7
fine	light	many small bubbles	lava froth from sticky lava	Pumice	6
fine or mixed	dark	has no quartz	low-silica lava; may shine/glimmer	Basalt	5
coarse	light	wide range of mixed color (pink, gray, white, etc.) and grain size	feldspar and quartz with minor mica, amphibole or pyroxene; used in counter tops; may shine/glimmer	Granite	5.5-6
very coarse	any color	usually in small intrusive bodies	typically granitic	Pegmatite	7

